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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Office of the Secretary
Federal Communications Commission
Washington, D.C. 20037

In the Matter Of

Amendment of the Commission's Rules)	CC Docket 92-166
to Establish Rules and Policies Pertaining)	FCC 94 - 11
to a Mobile Satellite Service in the)	
1610 - 1626.5 / 2483.5 - 2500 MHz)	
Frequency Bands)	

1. BACKGROUND

The undersigned is a communications systems engineer who has been active in the development and operation of communications satellites since 1966 (NASA's Applications Technology Satellites) and in addition has played a crucial role in the development of satellite-aided search and rescue systems (SARSAT) since 1975.

I fully endorse the Federal Communications Commission's (FCC) proposed rule making to expedite the development and operation of the proposed Mobile Satellite Systems (MSS). As indicated in the subject NPRM these services can provide almost limitless applications for the betterment of life in the United States as well as providing services to areas not currently having access to reliable communications.

The purpose of my response to the subject NPRM is to raise a number of issues that the FCC and the proposed MSS providers should examine before the MSS rules become final and the design of these systems is firm and committed to hardware and software development. Although I am aware that other actions and proposed rule making is underway by the FCC (Caller I.D. and location for 911 service), the issues contained herein should be examined in light of how they would impact system design if included in this rule making versus the impact of implementing these capabilities at a later date, possibly after the systems are in operation.

In presenting the issues and questions raised herein, it is not the intent of the writer to delay in any way the implementation of the proposed MSS systems. These issues will come to light sooner or later. Therefore, it is hoped that by raising these issues now, the FCC and the potential providers can agree on means for early resolution of these issues during the development and construction stage of these systems.

2. DISCUSSION OF TECHNICAL ISSUES

It is in the vital public interest that the MSS capabilities serve the public in times of individual perils (such as aircraft, marine and individual distresses) and the needs of large segments of the population during catastrophic disasters such as earthquakes, floods, hurricanes and fires. Individual perils will be addressed by discussion of the needs for **distress alerting and locating systems (DALs) and 911 service**. Catastrophic events will be addressed by discussion of **emergency response services**.

a. **Distress Alerting and Locating Systems (DALs) and 911 service.**

Current DALs service consists of one way data transmission and is provided for aircraft in the form of Emergency Locator Transmitters (ELTs); for maritime use in the form of Emergency Position Indicating Radio Beacons (EPIRBs); for individual use in the form of Personal Locator Beacons (PLBs). These systems have saved hundreds of lives each year. However, the potential of the MSS capability to provide much greater life saving is available because of a number of advantages: increased coverage; two-way communications; greater location accuracy; positive identification of the party in distress, and; potentially lower user equipment cost. These advantages are already built into the MSS system concepts proposed. To provide this increased benefit to search and rescue and 911 emergency response the following is needed by the responding organization:

- **Identification of the calling party**
- **Location of the calling party**
- **Routing of the distress message to the appropriate responder**
- **Standard format for SAR distress and E-911 (ANI & ALI ¹) messages**
- **Ability to return calls to the distressed party**

Current 911 service has undoubtedly saved thousands of lives each year. In many cases the service is implemented as an Enhanced 911 (E-911) service, which provides the Public Safety Answering Point (PSAP) with all of the above needs, including ANI and ALI, when the distressed party is using a landline telephone. Unfortunately, when cellular service was originated, in most cases, the cellular caller I.D. and approximate location were not provided to the PSAPs.² This has caused serious problems, undoubtedly loss of life and a large number of false alarms or hoax calls. An example of the effectiveness of E-911 vs. basic 911 service in dealing with false alarms and hoaxes was experienced when Columbus, Ohio updated its system to E-911. The city saved one million dollars a year from reduction in responses to false alarms.³

¹ ANI - Automatic Number Identification; ALI - Automatic Location Information

² See Texas Advisory Commission on State Emergency Communications Petition for Reconsideration concerning FCC GEN Docket No. 90-31, RM-7140, RM-7175, RM-7618, Dec. 8, 1993. and Reply to Oppositions to Petition for Reconsideration, GEN Docket No. 90-314 dated Jan. 12, 1994.

³ Information derived from the National Emergency Number Association (NENA)

Currently only about 72% of the US urban areas⁴ are covered by some form of 911 service. The opportunity for MSS to cover this gap is available to the public through use of MSS equipment and services.

b. Emergency Response Services

Surveys of Search and Rescue (SAR) and Emergency Services Responders have made loud and clear that the greatest single problem of these response personnel is the lack of interoperable communications. Fire personnel cannot communicate with police; federal, state and local government personnel cannot communicate with each other. **The MSS capabilities could solve this problem !** To do so they must be able to provide the following:

- **Priority Communications for SAR and Emergency Services**
- **Seamless communications between users of different MSS systems**
- **Standardized protocols for routing of data messages**

The recent earthquakes, floods and hurricanes that have plagued the American public in recent years has raised a high level of public awareness in the need for effective emergency response capabilities at the national, state and local level. In all of these disasters reliable communications has been a major problem affecting the capability of responders at all levels. Outages of public wire communications has led to extensive use of cellular systems by emergency responders only to find that the natural response of the public has also led them to turn to cellular. Result: inability of responders to have access to the only available interoperable communications system !

3. DISCUSSION OF PUBLIC ISSUES

In the introduction to the subject NPRM the FCC includes in its enumeration of possible applications of the MSS for position location, search and rescue communications and disaster management communications. These applications are surely in the public interest. However, other than in paragraph 5. (pages 44 and 45) the policy of the FCC toward providing these services to the public is not addressed. Several points need to be discussed in relation to the FCC's stated position, the intent of the MSS providers to provide these services, and the expectation of the general public whose welfare all parties should address.


- a. In their filings for licenses it is understood that most of the potential providers of MSS indicated they would provide distress and safety services as in part justification for frequency authorization. This is illustrated from selected pages of the FCC filings from various parties contained in the Attachment .
- b. The FCC has indicated in the subject NPRM that any MSS provider that "chooses to offer emergency or safety communications will coordinate its effort with the appropriate search and rescue organizations". It would appear that the MSS provider must also coordinate with organizations that are responsible for emergency services within the various states and territories, as the responsibility lies with these states and territories.

⁴ Information derived from the National Emergency Number Association (NENA)

- c. Distress calls must be routed to the proper response party. Dependent upon the location of the calling party the distress calls must be routed to the appropriate PSAP or Rescue Coordination Center (RCC).
- d. All MSS transceivers are potentially DISTRESS transmitters due to their ability to provide communications in remote areas as well as in urban areas. The MSS providers do not necessarily need to offer emergency or safety communications as an end product. However, in their offering of communications capability it would seem apparent that the general public's expectations for service would include those needs. In other words:
 - 1) By virtue of their connection to the PSTN the MSS providers are providing emergency services. Do they intend to label their transceivers with a disclaimer that it is not to be used in cases of emergency?
 - 2) All MSS providers need to comply with standards and call routing that will insure the safety and well being of the public in cases of emergency, while at the same time mitigate to the extent possible the extensive cost of dealing with false alarms and hoax calls.
- e. Providing emergency and safety services may be an issue which the MSS providers feel could lead to serious liability problems. As indicated above, lack of addressing the above issues could possibly lead to more serious liability problems. In any case, this should be dealt with, if necessary by public law, so that efficient emergency response capability is not denied to the public.

4. CONCLUSIONS & RECOMMENDATIONS

- 1. The FCC Proposed Rule Making is endorsed with the proviso that the issues of emergency response and emergency communications addressed above be addressed by the FCC in a manner that will allow the MSS providers to go forward without delay.
- 2. The FCC should require the MSS providers to address the above issues in their design and implementation. If necessary a national coordinating committee should be formed to address the issues of interoperability, routing of distress calls and standardization of protocols.
- 3. If the potential liability of MSS providers is considered an issue, it should be included in the rule or referred to the Congress for action. This potential problem should not be allowed to interfere with the common good of the public.


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ATTACHMENT

SELECTED PAGES FROM FILINGS TO
THE FCC
FROM
VARIOUS PROPOSED PROVIDERS OF MSS

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In re Application of:

MOTOROLA SATELLITE
COMMUNICATIONS, INC.

For Authority to Construct, Launch
and Operate a Low Earth Orbit
Satellite System in the
1610-1626.5 MHz Band.

File No.

IRIDIUM SYSTEM APPLICATION

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December 3, 1990

II. PUBLIC INTEREST CONSIDERATIONS

The IRIDIUM system is an ideal example of technology serving the public interest, convenience and necessity. Motorola's pioneering efforts have resulted in a system architecture that enjoys unprecedented spectrum efficiency, unlimited service flexibility, and unmatched geographical coverage. The IRIDIUM system truly meets the Commission's statutory mandate "to make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges ... for the purpose of promoting safety of life and property through the use of wire and radio communication ...," and "to encourage the provision of new technologies and services to the public."^{20/} Authorization of the IRIDIUM system will serve as a landmark of telecommunications development for many decades to come.

A. IRIDIUM Uniquely Meets the Mobile Service Needs of Users in the United States and Throughout the World

The IRIDIUM system, with its continuous global coverage to virtually all points on the surface of the earth and up to 100,000 feet above mean sea level, will bring the benefits of digital mobile voice and data service to all those individuals in the United States and abroad currently in need of reliable

^{20/} 47 U.S.C. §§ 151, 157 (1988).

countless public health benefits of the telephone from the house or office to the outdoors.

IRIDIUM also can be used by the aviation, shipping and trucking industries as a primary or backup communications system for emergency or distress situations, such as for missing planes and for accident location determination. By accurately relaying these reports to the appropriate authorities, IRIDIUM will help save lives.

E. Motorola Is Uniquely Qualified to Operate the IRIDIUM Satellite System

All of the public interest benefits of a proposed new technology are of little value if the applicant lacks the ability or commitment to implement the proposal. Motorola is uniquely qualified to bring the benefits of low earth orbit mobile satellite technology to the public. It was a pioneer in the development of cellular technologies and today is the largest U.S. manufacturer of cellular telephones and systems. Motorola also is a world leader in the production and development of private mobile radio services. Moreover, Motorola has extensive experience with developing satellite communications subsystems based on its work for the U.S. Government. The combination of all of these technologies and resources within one company has resulted in the development of its IRIDIUM system.

Motorola is firmly committed to the development and implementation of IRIDIUM. Over seventy-five engineers and

safety, law enforcement, aviation, navigation, ground transportation and resource management markets. See RDSS Allocation Order, 58 R.R.2d at 1431-33 (Appendix B). The recent application of Orbital Communications Corporation also projects a substantial RDSS market.^{25/}

Each IRIDIUM subscriber unit will have RDSS capabilities. Positioning determination based on IRIDIUM will be accurate within one mile for voice units. Optional GPS or GLONASS circuitry will be offered to improve accuracy to within 100 meters.

Motorola estimates that more than 3 million subscribers, over half of the subscriber base, will use RDSS and ancillary paging and messaging services in the following categories.

a. Emergency Services

IRIDIUM will provide RDSS emergency location services for planes, boats and land vehicles that have IRIDIUM receivers for voice and data services. Market estimates for this service are included in other categories which use IRIDIUM voice and data service, such as trucks, boats, aircraft, and recreational vehicles.

^{25/} Application of Orbital Communications Corporation for a Low-Orbit Mobile Satellite System, filed February, 1990, at 25-35. See Public Notice DS-953, released April 11, 1990.

paging users will be most frequent among the fifty million foreign business persons travelling in foreign countries each year. Motorola estimates a three percent penetration rate, assuming approximately the same penetration of pagers among foreign business persons as the penetration of pagers among the entire United States population today. As a result, it is expected that there will be 1.5 million global pager users among business persons traveling abroad. In the U.S., there will be a 6% penetration rate among 5,000,000 potential users, or 300,000 subscribers.

3. Voice and Data Services

IRIDIUM will not compete with the public switched telephone network ("PSTN") and terrestrial cellular systems primarily because of its rate structure. Instead, IRIDIUM will provide service to locations that do not otherwise have access to the PSTN or terrestrial cellular services. Major applications of IRIDIUM will be in governmental communications, international travel, commercial air travel, business and general aircraft, marine shipping, long-haul trucking, recreational vehicles, pleasure boats, construction and oil and mineral exploration.

a. Governmental Communications

As a satellite-based communications system, IRIDIUM essentially will be disaster proof. It can be used in emergency situations such as earthquakes, hurricanes, tornados, floods,

etc. Federal, state and local governments will use IRIDIUM as a secondary communications system in situations where standard communications services are inconvenient or impossible to access. Foreign governments will employ IRIDIUM extensively for emergency services as well as communication from areas without telephone service.

(1) Federal Government

The federal government has approximately 3 million civilian employees. Government agencies such as the Drug Enforcement Agency, Federal Bureau of Investigation, U.S. Customs Service, Coast Guard, and the State Department will use IRIDIUM for travel and emergency communications capabilities. United States diplomatic missions abroad also may use IRIDIUM as an emergency communications system.

Motorola estimates civilian federal government use as 10,000 subscribers. In addition, the armed forces could employ IRIDIUM for non-combat applications. Another 10,000 subscribers are estimated for this purpose.

IRIDIUM will enjoy significant use by foreign governments for communications in areas without telephone service. These foreign governments will likely purchase 400,000 units.

(2) State Governments

State governments in the United States have approximately 4 million employees. State governmental agencies will use IRIDIUM for law enforcement, emergency and travel applications. The penetration rate is estimated at 0.2 percent, or 8,000 subscribers. The international market for state governments is estimated at 20 times the U.S. market, or 160,000 subscribers.

(3) Local Governments

IRIDIUM will be used as an emergency or secondary communications system by municipalities and local governments. Individual local governments will have a limited number of units available for emergency communications in case of a natural disaster, such as the San Francisco earthquake. Police, firefighters, rescue teams, as well as the American Red Cross and other emergency organizations, will be able to use IRIDIUM units in areas where other communications are not available.

There are approximately 20,000 communities in the United States of various sizes (cities, towns, villages). The local governments in these communities employ approximately seven million people. An IRIDIUM penetration rate of 0.4% is assumed which results in 28,000 subscribers. International demand by local governments is estimated at 20 times that in the U.S., or 560,000 subscribers.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In re Application of)

ELLIPSAT CORPORATION)

For Authority to Construct)
ELLIPSOTM II, An Elliptical Orbit)
Communication Satellite System)
in the 1610-1626.5 MHz and)
2483.5-2500 MHz Bands)

File No.

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June 3, 1991

location throughout the world, via the satellite space segment, the GCS and the existing ground terrestrial telephone network.

Satellite Control. A telemetry, tracking and control station (TT&C) will be used to control the satellite, including maintenance of orbit parameters, and control of the on-board communications package.

Frequency Spectrum Plan. The ELLIPSO™ system fully operates in the bands 1610-1626.5 MHz (space-to-earth) and 2483.5-2500 MHz (earth-to-space). No other frequencies are presently required. Ellipsat complies with all FCC regulations governing use of these bands, including flux density restrictions, frequency usage, and modulation/access method. ELLIPSO™ will permit sharing with other conforming systems, radioastronomy users, and GLONASS.

B. DESCRIPTION OF SERVICES

ELLIPSO™ offers an innovative solution to the problem of providing cost effective and accurate position information to mobile transceivers by satellite. In addition, the system concurrently provides nationwide, satellite-based voice service uniquely capable of interconnecting with the public switched telephone network and the cellular mobile telephone switching office via a user transparent interface. Through this efficient use of spectrum, ELLIPSO™ offers a variety of services to support emergency, safety, and personal communication needs on a nationwide basis. It achieves these public interest benefits at

a cost comparable to current cellular systems. The publicly beneficial services offered by ELLIPSO™ are described below.

1. Position Determination By Satellite

ELLIPSO™ provides accurate positioning information by satellite that will be available to all system subscribers. The mobile user will be able to determine his location with an estimated initial position accuracy of at least 100 meters. This position information will also be available to others who may need to locate a mobile vehicle, such as a fleet dispatcher, emergency rescue and law enforcement personnel, or motorist assistant services. The positioning is accomplished through the system's Ground Control Stations, described below, which can automatically calculate the location of all transmitters in the system, and send that position information to the vehicle or to a third party. This information is valuable for safety-of-life and law enforcement purposes, including emergency locator services, nationwide car theft prevention, and motorist roadside assistance. Other uses include resource management, navigation, and exploration.

To provide these RDSS services, ELLIPSO™ plans to use Geobeacon, the satellite-based ranging system developed by Professor C. C. Counselman of the Massachusetts Institute of Technology (MIT), to locate transmitters in its system. The technology to implement this system is available today, and is based upon time difference of arrival and frequency difference of

advanced telephone services, but it offers Integrated Services Digital Network (ISDN) compatibility as well.

3. Demand for Services

a. Position Determination

The public interest benefits of position determination via satellite are well-established. See Report and Order, Gen. Docket No. 84-689, 58 R.R.2d 1516 (1985). Despite these benefits, the market for satellite position determination has been slow to develop. Previously authorized RDSS licensees have turned in their authorizations and the ability of Geostar Corporation, the only remaining radiodetermination satellite service (RDSS) licensee, to proceed with its dedicated system is now in doubt. Nonetheless, RDSS clearly constitutes a publicly beneficial service, as evidenced by the many instances where lives have been saved, stolen vehicles found and hazardous cargo controlled by means of satellite-based radiodetermination. The challenge is to meet the need for RDSS, while providing ancillary services that coexist with RDSS and provide the economic basis it requires. The ELLIPSO™ system will satisfy market demand for RDSS, while providing other services that are consistent with the primary purpose of the frequency band.

Recent low earth orbit satellite service applications indicate demand for emergency locators, messaging devices and low data rate transmission to be between 5 and 10 million users. See, e.g., Application of Orbital Communications Corporation, FCC

BEFORE THE
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MOTOROLA SATELLITE
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For Authority to Construct, Launch
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Satellite System in the
1610-1626.5 MHz Band

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) File No. 9-DSS-P-91(87)
) CSS-91-010
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To: The Commission

PETITION OF TRW INC.

TRW Inc. ("TRW"), by its attorneys and pursuant to Section 309(d) of the Communications Act of 1934, as amended, Section 25.392(b) of the Commission's Rules, and the Commission's April 1, 1991 Public Notice, Report No. DS-1068, 6 FCC Rcd 2083 (1991), hereby petitions the Commission with regard to the application of Motorola Satellite Communications, Inc. ("Motorola") for a low Earth orbit system of 77 satellites ("Iridium").

On May 31, 1991, TRW applied for authority to construct a satellite system called Odyssey that will provide capacity for radiodetermination and mobile voice and data satellite services using code division multiple access ("CDMA") spread spectrum modulation techniques. As a consequence of its filing, TRW is compelled to file this petition in order to seek

In sum, Odyssey will provide the following public benefits:

- Radiolocation, voice and data services to mobile users in all 50 states and U.S. territories, much of Canada and virtually all of Mexico;
- Designed to be compatible with simple, low-cost user radios -- similar to cellular with user interfaces identical to cellular;
- Redundant satellite coverage of all points ensures no gap in coverage with single satellite failures and also minimizes coverage "holes" due to terrain features;
- Easily extendable to multi-regional coverage with additional hub stations;
- The Odyssey "bent-pipe" design eliminates on-board processing and makes possible system improvements as technological developments or standards change;
- With use over the North American land mass, complementary coverage to the terrestrial cellular network:
 - Coverage for low density population areas where terrestrial cellular is uneconomical;
 - Less expensive service to cellular "roamers"; and
 - Coverage for cellular gaps and "holes";
- User charges are comparable to current terrestrial cellular systems;
- Low communication time delay compared to geostationary satellites to facilitate interactive voice communications;
- High elevation angles minimize obstruction by trees and buildings and terrain shadowing; and
- Provides inexpensive service to unserved segments of our society:

- Emergency service providers
- Farmers and ranchers
- Loggers
- Small truckers in rural areas
- Travelers and recreational vehicles in rural areas
- Small ships and airplanes.

All of the foregoing advantages, TRW submits, will ultimately inure to the benefit of TRW's customers and their respective end users, and generally further the public interest.

C. Summary Of Additional Regulatory Issues

1. Transceiver Licensing. In accordance with paragraphs 28-29 of the RDSS Licensing Order (104 F.C.C.2d at 666-67), TRW anticipates that its prospective service vendors will apply to the Commission for transceiver licensing in order to provide the radiodetermination, cellular telephony, paging and other services available with Odyssey and -- with TRW's assistance and system management -- will be primarily responsible for coordinating the use of such transceivers with other service providers and other users of the frequency spectrum.

2. Launch Authority. Following grant of its Odyssey system application, TRW will submit requests for launch and operating authority in accordance with its anticipated milestone schedule (see Figure I-2) and, in accordance with the

A. RDSS And Ancillary Data Services

TRW expects that RDSS services will comprise a significant percentage of its user volume. The requirement for radiolocation and radionavigation services, and the many potential beneficial applications for which they are well suited, have previously been documented by the Commission. See Amendment of the Commission's Rules to Allocate Spectrum for, and to Establish other Rules and Policies Pertaining to, a Radiodetermination Satellite Service, 58 R.R.2d 1416, 1417, 1431-33 (1985) ("RDSS Allocation Order"), recon. in part, 104 F.C.C.2d 637 (1986).

Odyssey's position-determining accuracy rivals the accuracy levels achievable with geostationary RDSS satellites, and Odyssey provides superior coverage of Alaska and much of northern Canada -- areas where accurate RDSS services may just mean the difference between life and death. Moreover, the fact that the Odyssey system will provide redundant satellite coverage with just twelve spacecraft means that the system will be exceptionally reliable -- a factor critical to certain radiolocation uses. Indeed, the Odyssey system can sustain the loss of one satellite in each of its three orbital planes and still maintain full multi-regional coverage.

Although TRW cannot know for certain what types of RDSS service configurations its customers will devise for

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Odyssey's capacity, it anticipates that several general categories of use will emerge, not the least important of which will be emergency services providers employing Odyssey capacity to locate accident victims, persons stranded in remote locations because of weather or injury, and to provide navigational assistance to motorists, pilots, and boaters.

Another major category of users of Odyssey's RDSS capacity will be businesses that want to track their products through the distribution system. Through Odyssey RDSS capacity, inventory, along with the vehicles and vessels transporting that inventory, could be tracked with precision at all times. Records could be maintained with up-to-the-minute accuracy, and communications with delivery personnel could be maintained through alphanumeric messaging. Odyssey capacity can also be used to provide low-cost alphanumeric messaging services to pagers on a multi-regional basis.

One market TRW expects to see tapped by means of the Odyssey system is the potential for position-determination for aircraft. Through Odyssey, it will be possible to determine the position of aircraft, and engage in associated data and voice communications, at costs that should encourage a substantial portion of the owners and operators of commercial aircraft, as well as general aviation owners, to equip their planes for Odyssey service. Moreover, major air carriers are now beginning to offer a variety of satellite-delivered

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File No.

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June 3, 1991

11 By providing RDS service, GLOBALSTAR offers increased safety for all United States citizens; reduced transportation, shipping, and labor costs; and improved navigational reliability. GLOBALSTAR also provides low-cost, efficient nationwide and global wire and radio-communication services.

Communications to and from rural areas in particular will improve greatly by introduction of GLOBALSTAR. Position location services will provide vital services in the areas of search and rescue and law enforcement, and will improve efficiency for industrial, emergency, and government operations. GLOBALSTAR will permit users to calculate position location at no charge.

THE APPLICANT IS READY TO CONSTRUCT

The Applicant is uniquely qualified to construct, launch and operate GLOBALSTAR. Loral Aerospace Corp. will provide the satellite expertise to operate the satellite system; and QUALCOMM, Inc. will provide the ground equipment expertise. The Applicant can thus provide a high quality, reliable RDSS/MSS system on a cost efficient basis.

The Applicant possesses the technical, legal, and financial qualifications to construct, launch, and operate GLOBALSTAR. GLOBALSTAR offers the Commission and the public significant benefits, including nationwide position location service and low-cost, cellular-like service for sparsely populated areas of the country. The expertise of the Applicant and the benefits of GLOBALSTAR dictate that this application should be granted.

3.3.1 Wireless Mobile RDSS

GLOBALSTAR provides RDSS on a stand-alone basis or in combination with messaging and voice communication services. By subscribing to these services in various combinations, the user can meet his location determination and communications needs at costs equal to or lower than those of comparable terrestrial facilities.

The most basic RDSS service GLOBALSTAR provides is the passive position location service in which the user's position is computed by the user himself. This service is based on a pilot tone that is transmitted by GLOBALSTAR. Applications for this service include recreational activities such as backpacking or boating. This service will be provided without charge to users with transceivers.

A second RDSS service GLOBALSTAR provides is RDSS with two-way messaging. In this case, the user may request that his position be computed by the gateway and communicated to him or to others, such as a hospital or home. This service may be used in the case of emergency, where the user wants to communicate his situation (e.g., medical emergency or disabled vehicle) to rescue service providers or family.

A third RDSS service GLOBALSTAR provides is RDSS with position computed by the gateway and communicated to selected subscribers. Applications for this service include location of fleet vehicles, tracking of hazardous waste shipments, tracking of military movements or location of stolen vehicles. Combining GLOBALSTAR and the PSTN, RDSS coverage for this service extends to the entire United States.

3.3.2 Wireless Mobile Voice and Data Services

GLOBALSTAR provides voice and data services in conjunction with terrestrial cellular telephone service providers and/or other communications service providers. GLOBALSTAR covers the following four main groups of users:

- o mobile users working and/or resident in areas without terrestrial coverage;
- o mobile users working and/or resident in areas with terrestrial coverage, but "roaming" into areas without terrestrial coverage; and
- o fixed users working and/or resident in areas without terrestrial coverage.
- o private or specialized network operators.

These groups of users may include, for example, governmental agencies, commercial users, managers of fleets of air, land and water vehicles, persons traveling on business or pleasure, emergency service providers, transportation entities and others.

Government agencies will benefit from two-way voice communications and position location capabilities in the areas of disaster relief, law enforcement, air traffic control, resource management and weather reporting.

Commercial users having potential need for the GLOBALSTAR system include rural facilities which are not served by the PSTN or cellular network, utilities which require regular but infrequent monitoring of their assets (e.g., meter reading), security (tracking of stolen property) and resource management systems (remote periodic monitoring of environmental variables).